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ABSTRACT

The construct validity of written Ideaphoria and oral Ideaphoria is discussed through analysis of their content and format and their correlations with tests of divergent thinking and writing speed. The current status of research on the measurement of divergent thinking ability is reviewed. Although the Ideaphoria tests have the same content as several commonly used tests of the ideational fluency aspect of divergent thinking, their administrations are quite different, and the abilities being measured may differ as a result. A factor analysis of the Ideaphoria tests, two tests of the flexibility aspect of divergent thinking, and writing speed shows the Ideaphoria tests to be only moderately correlated with the flexibility factor, and indicates a second factor defined by written Ideaphoria and writing speed. Additional data must be collected before it can be determined whether the Ideaphoria tests measure a type of ideational fluency, or instead measure simply the rate of production of verbal material. (Author)

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THE IDEAPHORIA WORKSAMPLES AS MEASURES OF DIVERGENT THINKING

by

Mark Daniel

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The Ideaphoria Worksamples as Measures of Divergent Thinking

Mark Daniel

Abstract: This paper discusses the construct validity of written Ideaphoria (Worksample 161) and oral Ideaphoria (Worksample 670) through analysis of their content and format and their correlations with tests of divergent thinking and writing speed. The current status of research on the measurement of divergent thinking ability is reviewed. Although the Ideaphoria tests have the same content as several commonly used tests of the ideational fluency aspect of divergent thinking, their administrations are quite different, and the abilities being measured may differ as a result. A factor analysis of the Ideaphoria tests, two tests of the flexibility aspect of divergent thinking, and writing speed shows the Ideaphoria tests to be only moderately correlated with the flexibility factor, and indicates a second factor defined by written Ideaphoria and writing speed. Additional data must be collected before it can be determined whether the Ideaphoria tests measure a type of ideational fluency, or instead measure simply the rate of production of verbal material.

Tests of Divergent Thinking

During the 1940s, J. P. Guilford and his co-workers began to develop a variety of tests of what he called "divergent thinking" (DT). These tests differ from the usual "convergent thinking" tests in that each item does not have a single specified correct answer; instead, there are many possible acceptable answers. General interest in DT tests increased substantially following Guilford's 1950 presidential address to the American Psychological Association on the need for research in this neglected area. The launching of Sputnik in 1957 set off a search for ways of identifying "creativity" in children, and research into DT tests became even more extensive. In addition to Guilford's (1967) tests, similar batteries of DT measures have been produced by Torrance (1962) and by Wallach and Kogan (1965).

Divergent thinking tests are most often scored using some type of quantity index. When the score is the number of appropriate responses without regard for their unusualness or quality, the test is said to be a measure of "fluency." When rarity of response is the basis for scoring, the test measures "originality," but again it is the quantity of unusual responses that determines the score. (Tests of "originality" typically score only those responses that are appropriate as well as unusual.) A third scoring method counts the number of changes in response type, and produces an index of "flexibility." Finally, some tests have been scored for "cleverness" as subjectively judged by trained raters; but this approach is uncommon, because it is not well suited to practical testing.

Another way in which DT tests differ is in the mode of the examinee's response. "Verbal production" tests (VPT) require a verbal (usually written) response, whereas "figural production" tests ask the examinee to make drawings. The great majority of research has been done with the former type of test.

The Educational Testing Service's Kit of Factor-Referenced Cognitive Tests (Ekstrom, French, and Harman 1976) recognizes seven factors of DT ability. These factors are far from being independent; in fact, a number of their intercorrelations are in the range .6 to .75 (Ekstrom, French, and Harman 1974). The factors were identified based on the results of numerous factor-analytic studies done by various researchers on a large number of tests. Five of the factors measure fluency:

FA Associational Fluency, "The ability to produce rapidly words which share a given area of meaning or some other common semantic property" (p. 41). Marker tests ask the examinee to list as many synonyms or antonyms of a given word as he or she can in a given time limit.

FE Expressional Fluency, "The ability to think rapidly of word groups or phrases" (p. 51). The marker tests ask the examinee to construct sentences which fit semantic or other restrictions. For example, the examinee may be asked to write sentences containing a given set of words.

FF Figural Fluency, "The ability to draw quickly a number of examples, elaborations, or restructurings based on a given visual or descriptive stimulus" (p. 61). The examinee may, for example, be asked to draw as many different decorations as possible on a series of simple line figures.

FI Ideational Fluency, "The facility to write a number of ideas about a given topic or exemplars of a given class of objects" (p. 67). In the marker tests for this factor, the examinee is asked to write ideas about a topic, or to list things that are alike in a specified way (e.g. things that are red).

FW Word Fluency, "The facility to produce words that fit one or more structural, phonetic or orthographic restrictions that are not relevant to the meaning of the words" (p. 73). The marker tests require the examinee to list as many words as possible that begin or end (or both) with a given letter, prefix, or suffix.

The two other factors in the ETS Kit are measures of flexibility:

XF Figural Flexibility, "The ability to change set in order to generate new and different solutions to figural problems" (p. 181). In one of the better marker tests for this factor, the examinee is shown a diagram of a container and an object that must be fitted into the container. The dimensions of both the container and the object are given. The examinee must show as many different ways as possible for several of the objects to fit in the container.

XU Flexibility of Use, "The mental set necessary to think of different uses for objects" (p. 197). One of the most often used marker tests asks examinees to list as many different uses as possible for a common object. The test is scored on the number of shifts

in type of use.

Given this plethora of overlapping factors, it is reasonable to try to consolidate them into a smaller number of more general factors. There is some evidence that the VPT tests and the figural production tests measure different characteristics (Horn 1976). Intuitively, there also seems to be a difference between the tests for associational, expressional, and word fluency, which appear to measure what might be called "linguistic facility," and tests for figural and ideational fluency and flexibility of use, which call for the production of new ideas which are not linguistic in nature. This latter distinction draws attention to the fact that DT tests can be closely or distantly related to what we normally think of as "creativity."

It has already been mentioned that two of the most common methods of scoring divergent thinking tests are to count the total number of appropriate responses (fluency) and to count the number of unusual appropriate responses (originality). Although each of the ETS tests is scored in only one way (usually for fluency), other research studies have investigated the relationship between fluency and originality scores. A prevalent point of view is that fluency is a necessary but not sufficient condition for originality (Milgram and Arad 1981). That is, if a person has a large number of ideas he or she is more likely to come up with original ideas. Of course, on any given test or item originality and fluency are bound to be highly correlated. Common responses tend to be given first, so a person who gives many responses is more likely to give uncommon responses. However, investigators who have controlled for this artifactual relationship between fluency and originality have found a strong correlation between them, with perhaps some room for discrimination between them (Horn 1976). For example, Wallach and Wing (1969) scored four tests on fluency and on originality, defined as the number of responses not given by any of the other 501 examinees in the sample. Disregarding correlations between fluency and originality scores on the same test, and correcting for attenuation, their data indicates a correlation of .88 between overall scores for fluency and originality. Findings such as this support the use of fluency scores (which are easier to calculate) rather than originality scores.

Validity of Divergent Thinking Tests

It is difficult to demonstrate the validity of divergent thinking tests as measures of creativity. Creative behavior is infrequent, and the level of creativity displayed by an individual in school or work is hard to measure. To compound the problem, some investigators have failed to control for level of verbal ability, which can have an effect on the criterion and which correlates in the range .2 to .3 with DT tests (Richards 1976). There is evidence that verbal ability and DT performance have a curvilinear relationship, such that they are correlated at low levels of verbal ability but are uncorrelated at high levels. In other words, above a certain level, verbal ability appears to have no effect on DT test performance (Richards 1976).

Wallach and Wing (1969) carried out a validation study in which they controlled for verbal ability. Their subjects were 502 entering college freshmen, who had a mean SAT-Verbal score of 619 (SD = 70). Using a questionnaire, the students indicated their past achievements in 34 types of activity, grouped into seven areas: leadership (e.g. holding office in a student organization), art (e.g. having art work exhibited or published), social service (e.g. receiving an award for service work), writing (e.g. having original writings published in a non-school publication), dramatic arts (e.g. playing a role in a theatrical production, debate, or speech contest), and science (e.g. building laboratory equipment). The students took four VPT tests: Alternate Uses; Similarities, in which they list ways in which two objects are alike; and Pattern Meanings and Line Meanings, in which they look at a simple design and list things it could be a picture of. All tests were scored for both fluency (number of responses) and originality (number of responses that were not given by any other examinee). As previously mentioned, the fluency and originality scores correlate .88 with each other, after removing correlations based on the same tests and correcting for attenuation.

Wallach and Wing found that SAT scores had no relationship with any of the categories of creative achievement. However, the overall fluency score was significantly related to achievements in the leadership, art, writing, and science areas (estimated correlations range from .1 to .3, with a median of about .2). Originality scores were related to achievements in art and writing, to about the same extent as fluency scores, but were not related to leadership or science achievements. The reliabilities of the fluency and originality scores were not very different (.89 and .79 respectively), so the results are not attributable to differences in reliability. This study suggests that fluency scores are at least as strongly related as originality scores to leadership in student organizations and productivity in art, writing, and science. The researchers interpret the lack of relationship to achievements in music and the dramatic arts as support for the validity of DT tests as measures of original thinking: in art, writing, and science one produces original work, whereas in dramatic arts and music one usually reproduces the work of others.

Barron (1955) reports a different type of validation study, involving 100 military officers who participated in a two-day assessment center and who were rated by observers for several characteristics, including "originality." Originality scores on two DT tests, Uses and Consequences (in which the examinee lists things that would happen if a given improbable event were to occur), correlated .30 and .36 with the originality ratings. Unfortunately this study does not control for differences in verbal ability, which might account for some of the correlation between VPT tests and the ratings.

Torrance (1962) describes a study of department store saleswomen. Those in the top third in sales performance were significantly higher on a composite DT score than those in the bottom third. Also, those whose jobs required a high level of involvement with customers scored significantly higher on the tests than those in jobs requiring less interaction. The tests included VPT and figural production tasks, and were scored on originality and flexibility as well as fluency.

A number of studies have used teachers' ratings of creativity as a criterion, and have generally found modest correlations with DT tests. Verbal ability is often a confounding element in these studies, and, as Horn (1976) points out, observers' ratings of creativity are suspect because raters may differ in what they consider "creative" behavior, and may have a hard time distinguishing between creative and intelligent behavior. Horn cites an interesting study by Vernon (1972) which showed that, after controlling for verbal ability, VPT scores were substantially related to teachers' ratings of the overall quality of essay and story writing, but not to ratings of the originality and creativity of those pieces of writing.

In summary, DT tests are related to reported achievements in art, writing, science, and leadership. The relationship to rated creativity of output or behavior is less clear, at least partly because of the difficulty of distinguishing between creativity and ability. Fluency scores seem to be as strongly related as originality scores to the criteria. There is a lack of data on the DT score levels of people in different occupations, which would be of great interest.

Description of the Ideaphoria Tests

The Johnson O'Connor Research Foundation developed a DT test called Ideaphoria (Worksample 161) in the 1930s (Daniel 1980a). This test was adapted from the "Predictions" tests of the British Industrial Fatigue Research Board. In this test, the examinee is asked what he would to, and what others should do, if a certain impossible event or situation were to occur (such as everyone being able to live without food). A ten minute time limit is allowed for the examinee to write as much as possible in response to the question. The instructions tell the examinee to write in continuous narrative, and make it clear that scoring will be based on the quantity rather than the quality of what is written; the examinee is even told that it does not matter whether his writing is legible, as long as it is clear where one word ends and the next begins. The raw score on the test is the total number of words written. When the test was first developed it was scored on the number of ideas, but that scoring method was changed in an effort to reduce the correlation with English vocabulary.

The written Ideaphoria test has a fairly high (approximately .6) correlation with a test of writing speed. Therefore, an oral version, Worksample 670, has been constructed (Bowker 1975a). This test uses the same type of question as written Ideaphoria, but the examinee speaks his response into a tape recorder, and the time limit is five minutes rather than ten. The instructions for oral Ideaphoria place a greater emphasis on sticking to the topic, although it is still made clear that the test will be scored on quantity, not quality. The raw score is the number of words spoken.

Validation studies indicate that members of the following occupational groups score higher than the general population on the written Ideaphoria test: salesmen, high school teachers, lawyers, physicians, reporters and editors, actuaries, and guidance counselors. Low scores have been found for bank employees and clerical workers. The following groups tend to

score about the same as the general population: managers and executives, computer programmers and systems analysts, musicians, elementary school teachers, engineers, and technical workers. Although salesmen as a group tend to score high, there does not appear to be a relationship between written Ideaphoria score and degree of success or tenure. On the other hand, a study of 58 technical engineers showed a correlation of .45 between written Ideaphoria score and job success, even though the group scored no higher than the general population. The Ideaphoria test is unrelated to academic success in high school and college, but there appear to be some differences among students in different fields of study, with students in English, history, biological sciences, and economics scoring relatively high, and accounting majors scoring relatively low. (Sources: Bowker 1981; Brodie and Foxley 1982; Daniel 1980a, 1982; Foxley, Brodie, and Daniel 1982; Plancon and Daniel 1978)

Comparison of Ideaphoria and Other Divergent Thinking Tests

The Ideaphoria tests are almost identical in stimulus content to several tests which would be considered to measure the ideational fluency dimension of DT ability. The batteries of both Guilford and Torrance contain tests which present an impossible situation and ask the examinees to write what would happen as a result. However, the methods of administration and scoring of these tests are quite different than for Ideaphoria, and the differences may alter what the tests are measuring.

First, the Guilford test (called "Consequences") and the Torrance test instruct the examinee to list responses, rather than write continuous narrative. Second, they ask the examinee to give as many different ideas as possible. They emphasize the importance of quantity, but they request a large number of different ideas, not a large volume of writing or speech. By contrast, the Ideaphoria test instructions make clear that content is irrelevant when they say that legibility is unimportant. Third, the Guilford and Torrance tests present several different topic questions, and allow much less time for responding to each question: Guilford allows two minutes for each of ten topics, and Torrance permits a total of five minutes during which examinees respond to three questions. Finally, these tests are scored on the number of distinct and relevant ideas produced by the examinee, rather than simply the number of words written.

The Ideaphoria instructions could be expected to make those tests measures of rate of production of verbal material, which might be termed "glibness," rather than ideational fluency. The instructions ask the examinee to write constantly. The underlying premise of the Ideaphoria tests is that a person who has a rapid flow of ideas will be able to maintain a faster rate of word production than one who is low in ideational fluency. However, whether and to what extent such a relationship between idea production and word production exists is an unanswered empirical question. Certainly, the high (about .6) correlation between written Ideaphoria and writing speed reduces the amount of Ideaphoria variance that can be reflective of ideational fluency (unless it is hypothesized that idea flow and writing speed are correlated). The fact that examinees write or speak about the same number of words in the first and second halves of the Ideaphoria test (Bowker 1976, Daniel 1978) is further evi-

dence that the tests are not measuring ideational fluency. Common and obvious ideas would tend to occur to the examinee during the first half of the test, whereas during the second half the examinee would have to search for more unusual ideas; yet there is no slowdown in the rate of output during the second half. In themselves, the lengthy time limits on the Ideaphoria tests might be conducive to the measurement of ideational fluency or creativity, because they allow more time for the production of unusual ideas.

In addition to eliciting a flow of words rather than a flow of ideas, the Ideaphoria instructions, and in particular the instructions for written Ideaphoria, are ambiguous. The instruction to write about the topic is in contradiction to the implied instruction that content does not matter. Hence, the Ideaphoria tests measure in part the examinee's interpretation of the task. Bowker (1975b) examined 100 cases of written Ideaphoria and found that 85 examinees stuck to the topic, eight started off writing about the topic but strayed away from it, four did not write about the topic at all, and three either repeated words or phrases, or listed words. Although the instructions have since been modified to reduce ambiguity, the changes were relatively minor and had little effect on score level and no effect on the correlation with writing speed (Daniel 1980b).

Statistical Relationships Between the Ideaphoria Tests and Other Divergent Thinking Tests

As mentioned above, the extent of relationship between the "glibness" measured by the Ideaphoria tests and the ideational fluency measured by the Consequences test and other similar tests is a matter for empirical investigation. The most straightforward approach to this question would be to administer a test like Consequences along with the standard Ideaphoria tests and several other DT tests. Of primary interest would be the correlations between the Ideaphoria tests and the Consequences test, and the relative correlations of all three tests with other DT tests and with writing speed. Such an experiment is now being planned.

Another way of investigating the construct validity of the Ideaphoria tests would be to replicate the Wallach and Wing validation study using a checklist of creative accomplishments. The Ideaphoria tests might be distinct from the Consequences test and other DT tests but still be related to the real-world criteria.

In the meantime, it is possible to examine the relationship of the Ideaphoria tests to other DT tests using existing data. Two DT tests have recently been administered to 209 examinees as part of the Johnson O'Connor Research Foundation battery. The first of these, called Foresight (Worksample 307), is very similar to the Pattern Meanings and Line Meanings tests used by Wallach and Wing (1969). On each of the six items, a simple abstract line drawing is shown to the examinee for 45 seconds, during which time the examinee is told to write down as many things as possible that the drawing "makes you think of, looks like, reminds you of, or suggests to you." The second is a three-item version of the Alternate Uses test (Worksample 701). During the one and one-half minute time limit for each item, the examinee is asked to write as many different uses as

possible for a common object. On both the Foresight and Uses tests, the score is the total number of responses. In the ETS Kit's taxonomy of DT tests, Uses would probably be considered a measure of the flexibility of use factor, although it is scored on number of responses rather than number of shifts in response. The Foresight test would also seem to measure flexibility, because it requires seeing many different possibilities in a single stimulus. However, as Ekstrom, French, and Harman (1974) showed, it is not easy to separate flexibility from fluency; many of the DT dimensions are fairly highly intercorrelated, and so these two tests may be considered measures of the general DT ability as well as of the specific flexibility dimension.

Because the examinee sample includes both sexes (55% males) and a wide age range (16 to 40; mean = 22.6, sd = 6.0), sex and age variation in test scores have been statistically removed prior to analysis. First, for each sex separately, score on each of the four DT tests and on the Writing Speed test has been regressed on age and age^2. If age^2 added significantly to the multiple correlation with test score, the quadratic regression equation was used; otherwise, the linear regression equation was used. The resulting prediction equations are given in Table 1. The written Ideaphoria and Foresight tests were scored on percentile age norms, so there is little age variation for those scores. For oral Ideaphoria (scored on percentiles not broken down by age), Uses, and Writing Speed, the age differences are in some cases quite large.

Table 1

Prediction of Test Score from Age and Age^2

Test	*N*	Unstandardized Reg. Weights		R^2
		Age	Age^2	
Males				
Written Ideaphoria (age %ile)	448	-6.27	.118	.025
Oral Ideaphoria (%ile)	119	2.17	--	.138
Foresight (age %ile)	448	-.287	--	.003
Uses (raw score)	359	.323	--	.055
Writing Speed (raw score)	421	.694	--	.008
Females				
Written Ideaphoria (age %ile)	318	-3.61	.0747	.014
Oral Ideaphoria (%ile)	95	.577	--	.013
Foresight (age %ile)	318	-2.21	.0349	.012
Uses (raw score)	248	.290	--	.057
Writing Speed (raw score)	307	2.04	--	.129

Age variation was removed by subtracting scores, using the above equations, from actual scores. The resulting scores were then standardized within each sex to remove sex differences. A total of 114 males and 95 females have scores for all five tests; these cases were used in the subsequent analyses.

The intercorrelation matrix is shown in Table 2. The zero-order correlations among all five tests are given above the diagonal. Writing Speed has been partialled out of the correlations shown below the diagonal. Writing Speed correlates highly only with written Ideaphoria. Even though both Foresight and Uses require written responses, it appears that sheer speed of writing does not have a great deal of influence on these scores. As a result, the partial correlations do not differ greatly from the unpartialled correlations. The largest effect of partialling is to reduce the correlation between written Ideaphoria and Foresight from .39 to .33.

Table 2

Correlations (Above Diagonal), and Partial Correlations, Controlling for Writing Speed (Below Diagonal)

	Written Idea.	Oral Idea.	Fore-sight	Uses	Writing Speed
Written Ideaphoria	1.000	.433	.392	.332	.515
Oral Ideaphoria	.410	1.000	.376	.340	.168
Foresight	.334	.353	1.000	.543	.218
Uses	.299	.323	.528	1.000	.153
Writing Speed	--	--	--	--	1.000

Considering only the partial correlations, the strongest relationship is between Foresight and Uses, the two tests most similar to outside tests of divergent thinking. The two Ideaphoria tests are the next most highly correlated. However, their intercorrelation is surprisingly small, given their high (above .9) internal reliabilities (Daniel 1980a). Several interpretations of this relatively low correlation may be made. As mentioned previously, the instructions for the two Ideaphoria tests differ: the oral Ideaphoria instructions emphasize sticking to the topic. Thus, an examinee who interprets the instructions for written Ideaphoria liberally, and does not try to stick to the topic, will be doing a somewhat different task when he or she takes oral Ideaphoria. The low intercorrelation could mean that the Ideaphoria tests measure abilities which are specific to the medium of expression. If this is true, then neither ideational fluency nor glibness would be an accurate description of what the tests measure; it would be more correct to say that written Ideaphoria measures speed of written production of verbal material, and oral Ideaphoria measures speed of oral production of verbal material. The common element in these two tests, whether ideational fluency or glibness, is a minor determiner of performance on the tests.

The Ideaphoria tests correlate moderately with the Uses and Foresight tests, suggesting that the Ideaphoria tests measure the general DT factor to a small but real extent. The fact that oral Ideaphoria correlates slightly higher than written Ideaphoria with the two other DT tests could be explained in any of three ways: first, that the written medium constrains expression of ideas, because writing is slower than speech; second, that instructions to stick to the topic elicit individual differences that are more reflective of ideational fluency or flexibility; and third, that

the ambiguity of the written Ideaphoria instructions causes examinees to differ in how they interpret the task, and this error variance attenuates correlations.

Factor analysis can further illuminate the relationships among the tests. The results of a maximum-likelihood common-factor procedure (Rao's canonical factor analysis) are shown in Table 3, and are presented graphically in Figure 1. One of the features of this factor-analytic method is that after the extraction of each factor it tests the residual covariance matrix for statistically significant non-randomness. Two significant factors are extracted in the present study. In a direct oblique rotation, these factors correlate .49 ($\delta = 0$). The first factor correlates highly with Foresight and Uses, and the second has high correlations with written Ideaphoria and Writing Speed. Oral Ideaphoria has moderate loadings on both factors.

Table 3

Results of Canonical Factor Analysis

Variable	Unrotated		Oblique Rotation[a]		Iterated Communality
	F1	F2	F1	F2	
Written Ideaphoria	.775	-.317	.518	.827	.70
Oral Ideaphoria	.542	.067	.504	.428	.30
Foresight	.659	.352	.747	.380	.56
Uses	.599	.414	.725	.296	.53
Writing Speed	.502	-.371	.253	.621	.39
Eigenvalue	2.411	1.026			

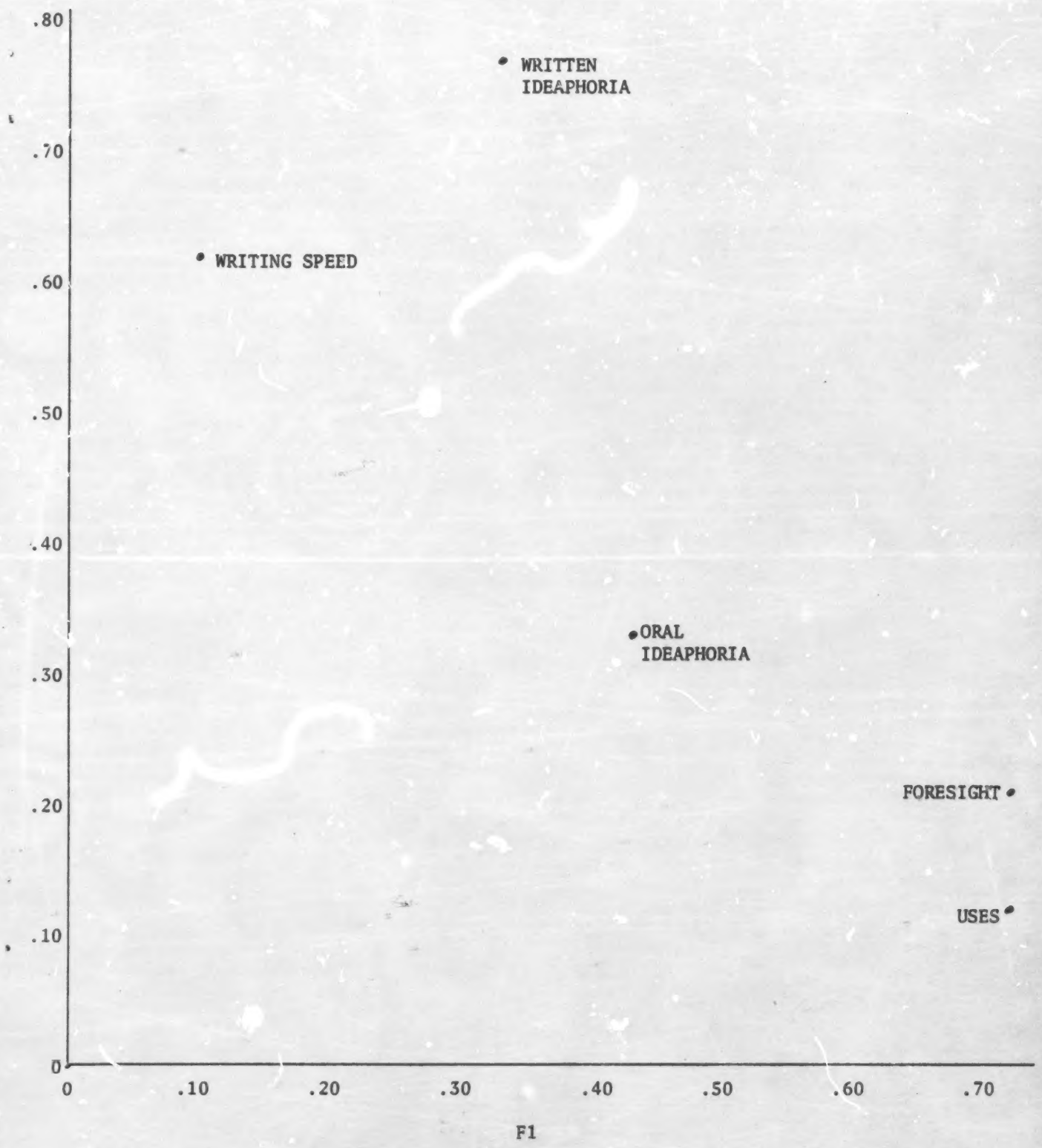
[a] Factor structure (correlations between tests and factors). The correlation between the factors is .487.

Note: $N = 209$

The factor analysis shows that the Ideaphoria tests have moderate correlations with the factor defined by Foresight and Uses. In addition, written Ideaphoria is strongly related to a factor defined by it and Writing Speed. Because oral Ideaphoria correlates only modestly with this second factor, this dimension must represent variance which is fairly specific to written Ideaphoria and Writing Speed, i.e., rate of written production of verbal material. Only 30% of the variance of oral Ideaphoria is explained by these two factors, as shown by its communality, meaning that this test is measuring some third dimension of ability which does not sufficiently overlap with the other tests to have been identified in the factor analysis. Thus, the factor analysis supports the previously-drawn conclusion that oral and written Ideaphoria are fundamentally measures of different characteristics.

Figure 1

Rao's Canonical Factor Analysis, Varimax Rotation



Conclusions and Directions for Future Research

Logical analysis of the Ideaphoria tests suggests that they are likely to measure rate of production of verbal material, rather than ideational fluency as measured by outside DT tests such as Guilford's Consequences test. (Whether rate of verbal production is correlated with ideational fluency is an unanswered empirical question.) The ambiguity of the instructions for written Ideaphoria could be expected to reduce the validity of that test as a measure of any DT ability. The statistical analyses support these conclusions, and furthermore indicate that oral and written Ideaphoria are measuring largely distinct characteristics.

From any point of view, it would appear to be a desirable first step to revise the instructions for written Ideaphoria so that they emphasize the importance of sticking to the topic, while still encouraging the examinee to produce a large quantity of output. It may also be advantageous to make the scoring procedures on both Ideaphoria tests consistent with the instructions by not counting those portions of the examinee's response that are clearly unrelated to the topic question. Toward the same end, perhaps the practice of having examinees count their own words on written Ideaphoria should be discontinued.

A test such as Consequences could be administered to provide data on the correlation of the Ideaphoria tests with ideational fluency, and to show the correlations of all three tests with writing speed and other DT measures. A study including Consequences, two or more different VPT tests such as Uses and Foresight, and written and oral versions of tests of expressional fluency (e.g. tests requiring the construction of sentences containing given words), could potentially demonstrate the presence of several dimensions of DT, such as written verbal production (written Ideaphoria and written expressional fluency), oral verbal production (oral Ideaphoria and oral expressional fluency), and ideational fluency or flexibility (Uses, Foresight, and perhaps Consequences).

Finally, criterion-related validation studies are needed to guide the interpretation of different dimensions of DT ability. A study like the one reported by Wallach and Wing (1969) using reports of past activities in creative areas would help in evaluating the relative usefulness of flexibility, written verbal production, and oral verbal production as predictors of future achievements in specific fields. Even if the Ideaphoria tests are not good measures of ideational fluency, they may be related to performance in certain occupations, such as written Ideaphoria in journalism and oral Ideaphoria in sales or teaching. The validation information which has already been accumulated on these tests shows that they can be useful in vocational counseling. There is a need for studies which will indicate the discriminant validity of these tests as compared with tests of ideational fluency or other DT dimensions.

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